CONTRIBUTIONS TO THE ANATOMY OF THE INDIAN ELEPHANT (ELEPHAS INDICUS), PART II. URINARY AND GENERATIVE ORGANS[1]. By M. WATSON, M.D., *Demonstrator of Anatomy in the University of Edinburgh.* (Plate 4.)

ALTHOUGH the urinary and generative organs of the Indian elephant have been described by various authors who have examined them in whole or in part, yet these descriptions differ so much from one another that it may not be altogether superfluous to put on record the results of my own observations on these parts of the animal, more especially as there is no systematic account of them to which the exclusively English reader can refer.

I shall in the first place consider the urinary and in the second the generative organs, comparing the observations of different authors as we proceed.

For the opportunity of dissecting these parts I have again to express my thanks to Prof. Turner.

URINARY ORGANS.

Kidney. This viscus measures one foot in length and seven inches in greatest breadth, thus differing materially in size from that examined by Stukeley[2], which measured three feet in length: his measurement, however, I cannot avoid thinking, has been somewhat exaggerated. It is triangular in form, tapering toward the anterior, but thick and rounded at the posterior extremity. Its outer border is uniformly convex, except where it is interrupted by lines indicating the subdivision of the organ into lobes. The inner border is also convex, but presents about its centre a deep concavity—the hilus—for the entrance of the renal vessels and duct. These occupy the usual relative positions, the ureter being situated dorsally, the vein ventrally, and the artery between the two. The capsule, which is strong and composed of dense fibrous tissue, adheres so closely

[1] Part I. On the Thoracic Viscera, appeared in this *Journal*, November, 1871.
[2] *Essay towards the Anatomy of the Elephant*, Lond. 1723.

to the kidney as to allow of its subdivision into lobes being seen externally; it is however readily separable from the contained organ. On separating the capsule many vessels of large size are to be seen passing from the substance of the kidney into and through the capsule, demonstrating in this animal perforating arteries which in all probability communicated with the parietal branches of the abdominal aorta in a manner similar to that described by Prof. Turner[1] in the human subject. With reference to the number of lobes of the kidney, Camper[2] states that there are eight or nine, Cuvier[3] reduces the number to four, whilst Mayer[4] observes that it is composed of only two principal lobes. Dönitz[5] ascertained the number to be ten in that of the African elephant. In my own specimen the number of lobes in the left kidney was five, and these could be readily separated from one another without any laceration of the renal tissue. The number in the right kidney was unfortunately not observed in the same satisfactory manner, but, judging from the primary divisions of the ureter, which in the left kidney corresponded in number to the lobes, there would be four. On the surfaces of both kidneys, moreover, indications of a farther subdivision into smaller lobes were observed, but these were not traceable to any depth without rupture of the renal substance. It is however probable, I think, that these lines of separation indicate the subdivision of the kidney into lobes in the young animal, and that they become less and less distinct as the animal grows, and may finally be obliterated altogether. That the lobes are originally distinct, as in many animals, is proved by Camper's[6] dissection of a young specimen, in which he found that the lobes were only beginning to unite toward the exterior of the organ, their inner or apical extremities being altogether free. If this view be correct, it will explain the diversity of statement of different authors with regard to the number of the lobes.

Each of these lobes is to be regarded as a renal organ

[1] *Brit. and For. Med.-Chir. Rev.* July, 1863.
[2] *Description anatomique d'un éléphant mâle.*
[3] *Leçons d'anatomie comparée*, Paris, 1805.
[4] *Nova acta acad. Cæs. Leo. Car.* XXII.
[5] *Reichert und Du Bois-Reymond's Archiv*, 1872, p. 85.
[6] *Description anatomique d'un éléphant mâle.*

complete in itself, possessing as it does a perfect system of tubes which do not intermingle with those of the neighbouring lobes. The kidney of the elephant thus presents an approach in structure to that of the cetacea and other aquatic mammals, differing however in this, that whilst in the latter the lobes are permanently distinct, in the former they are distinct during youth, but become more intimately blended as the animal attains maturity. With reference to the more minute structure, Cuvier states that there is no distinct line of separation between the cortical and medullary substances, while on the other hand Dönitz found the distinction between them as well marked as in the majority of animals. My own observations agree with those of Cuvier, at the same time it must be borne in mind that these kidneys had been subjected to the action of spirit for some time, which may have rendered the distinction between the substances less apparent to the naked eye than would otherwise have been the case. The tubes of Bellini do not terminate on papillæ as asserted by Cuvier, Mayer, Hunter[1] and Owen[2], but upon the flattened truncated extremities of the calyces in a manner which will be more particularly referred to along with the ureter.

The renal artery divides into three main trunks, each of which again subdivides into numerous branches, which enter the substance of the kidney. Before dividing, the trunk of the renal artery, as observed by Camper, gives off the spermatic artery to the testicle—an arrangement by no means uncommon in the human subject. The veins passing from the kidney are five in number, but whether they terminate in a common trunk or open separately into the posterior cava, could not be determined by reason of the organs having been removed from the abdomen. The calyces differ in number in the two kidneys, ten in the right, and thirteen in the left. It would thus appear that the number of calyces bears no constant ratio to that of the lobes, some of these being provided with two, and others with three calyces. The calyces are in the form of flattened tubes, terminating in a truncated flattened extremity, in the centre of which is to be observed a single aperture of large size.

[1] *Essays and Observations*, by Owen.
[2] *Anatomy of Vertebrates*, III.

On slitting open this aperture, it is seen to lead into a cribriform vault, the cribriform appearance of which is due to the openings of the tubules of Bellini. According to Dönitz, in the kidney of the African elephant, the aperture just described leads into an elongated central canal—the tubus maximus of Hyrtl[1], along the course of which the tubules of Bellini open: but in that of the Indian elephant this is not the case, as the central tubules of each calyx are prolonged downwards so far as to be little shorter than those of the periphery, which gives rise to the appearance of a shallow vault rather than to that of an elongated central canal such as is figured by Dönitz.

With the exception of Camper, as already stated, all the older writers have been deceived as to the existence of papillæ in the kidney of the elephant.

According to Cuvier and Mayer the ureter is formed by the union of three principal tubes. In the present specimen the ureter of the right side is formed by the junction of four and that of the left by five. In both kidneys these tubes emerge separately from the hilus. In the case of the right kidney the two anterior tubes unite to form one half of the ureter, the second half being formed by the junction of the two posterior tubes; whilst in the left kidney the one half is formed by the junction of the three anterior, and the second half by the junction of the two posterior. As regards the number of calyces opening into each of these tubes, enumerating them from before backwards, we find that in the right kidney the first receives two, the second two, the third three, and the fourth three, in all ten; in the left kidney the first receives two, the second two, the third three, the fourth three, and the fifth three, in all thirteen. The want of symmetry as regards the number of these tubes in the kidneys of opposite sides seems to indicate that this is not constant, which would account for the difference between my own observations and those of the authors already quoted.

There is, as stated by Cuvier[2], no pelvis properly so called, the tubes simply uniting without marked dilatation to form the ureter. This tube passes backwards so as to reach the posterior

[1] *Denk. der Acad. der Wissenschf.* Wien xxxi. 1872.
[2] *Leçons d'anatomie comparée.*

wall of the bladder, being invested on its under surface by peritoneum; as it passes between the bladder and rectum, it lies directly above the corresponding vas deferens. Having reached the back of the bladder, the two ureters are separated from one another by a distance of $3\frac{1}{2}$ inches. They then pass obliquely through the wall of this viscus for a distance of $2\frac{3}{4}$ inches, and open close together near the neck of the bladder. The very oblique and lengthened course of these tubes through the wall must form a thoroughly effective valve against the backward passage of the urine.

Bladder. This viscus is by no means so large as one would expect in an animal of such size. It is regularly oval in form, and occupies the usual position. Above it is the rectum, the vesiculæ seminales, and vasa deferentia intervening, whilst at the neck are to be observed the small prostatic glands, two in number on each side. The whole of the bladder, with the exception of the triangular interval, indicated by the points of contact of the ureters with the exterior of the bladder and the neck of the viscus, is completely invested by peritoneum, this investment on the lower aspect reaching as far back as the commencement of the urethra. The peritoneum covering the bladder presents moreover three well-marked folds or ligaments. Of these, one passes off from the inferior aspect of the viscus, and seems to correspond to that described by Camper[1] as attaching the bladder to the pubis. The author just mentioned observed in it the urachus, but no remnant of that structure could be discovered in the specimen under description, its absence being in all probability due to the age of the animal. The other two folds pass off from the lateral aspects of the bladder, and like the lower fold, each is composed of a double layer of peritoneum, and encloses, moreover, an artery which was still pervious in certain parts of its course. This artery is probably the hypogastric, but neither this nor the points of attachment of the peritoneal folds to the abdominal wall could be accurately ascertained, the parts having been removed from the pelvis.

On slitting open the bladder, the apparent thickness of its wall is seen to be due rather to the peritoneum, and sub-

[1] *Description anatomique d'un éléphant mâle.*

peritoneal connective tissue, than to the proper muscular coat. The mucous membrane is uniformly smooth, and is not thrown into folds, except at the neck of the viscus, where it forms a single median fold of large size, which, commencing between the openings of the ureters, passes forwards to terminate on the floor of the urethra close to the base of the veru-montanum.

Generative Organs.

Testicle. This organ, which is almost globular in form, lies as figured by Camper[1] inferior to the posterior extremity of the kidney. It is entirely invested by peritoneum, with the exception of its upper and external margin where the vessels enter. The peritoneum, when traced outward, is seen to be reflected from the surface of the testicle, and to pass between it and the epididymis, the lower surface of which it also covers. The manner in which the peritoneum attaches the testicle to the posterior extremity of the kidney, notwithstanding that it permits of a slight degree of mobility of the former, altogether negatives the suggestion of Mayer[2], that this organ descends to the perineum during the period of rut. The epididymis lies along the outer side of the testicle and not the inner, as stated by some authors.

The spermatic artery, as before said, is given off from the trunk of the renal, it passes backward, and after a short course divides into four or five branches, which supply the organ. It gives, moreover, several branches of small size to the epididymis. The testicle also receives some branches of small size from arteries situated in front of it, but the exact origins of these could not be ascertained.

The veins leaving the testicle are remarkable for their number and large size. They are seven or eight in number, and communicate freely with one another, as also with neighbouring veins, so as to form a plexus close to the testicle. They finally unite to form two large trunks which open into the vena cava on the right side. The valves are very numerous in the veins composing this plexus.

[1] *Description anatomique d'un éléphant mâle.*
[2] *Nova acta Acad. Cæs. Leo. Car.* XXII.

Several nerves of large size pass to the testicle along with the vessels.

The excretory ducts of the testicle (vasa efferentia) are ten or twelve in number, they pass off from the anterior extremity of the hilus of the testicle, and diverging as they pass outwards, enter the epididymis. With regard to the extent of this structure, it is impossible to say where it terminates, or where the vas deferens begins, as the vas does not form a flexure upon the epididymis as in those animals in which the testicle descends into a scrotum, but is simply continuous without interruption with the epididymis. The anterior extremity of the epididymis (Globus major) is the widest part, and on tracing it back we find that the size of its loops gradually decreases, so as to become continuous with those of the vas.

As regards this tube, with the exception of 5 inches previous to its termination, it is seen to be convoluted in the whole of its course. Its central portion is less convoluted than either of its extremities, and the anterior less so than the posterior; the latter extending from the peritoneal fold which unites the vasa of opposite sides down to the point where it becomes quite straight, being in fact so extremely convoluted as to resemble rather a second vesicula seminalis, than a portion of the vas deferens. Throughout the whole of this part of its course each vas is attached to the superior abdominal wall by a double fold of peritoneum, which forms as it were a ligament for it. The ligaments of opposite sides become continuous with one another between the bladder and rectum, and thus form a fold corresponding in position to the broad ligament of the uterus in the female. The vesicula prostatica, however, does not extend into this fold, as it does in the goat, ass, &c. With reference to the straight or terminal part of its course, each vas lies between the corresponding vesicula and the upper surface of the bladder, and before opening into the urethra dilates abruptly into an ampulla two inches in length, which is closely connected to its fellow of the opposite side. Finally, the vas unites with the efferent duct of the corresponding vesicula, the common ejaculatory duct thus formed opening into the urethra.

Whilst Cuvier's observations on these parts agree with my own, Owen, on the other hand, states that after dilating into

the ampullæ, the vasa open "into the urethra distinctly from the vesicular glands."

Vesiculæ seminales.—These have been figured by Camper, and described by Cuvier. By the other writers on the elephant they are omitted. Each vesicula is an elongated sac six inches in length and one inch and a half in diameter, and occupies the interval between the bladder and rectum, being separated from the former by the ampulla of the corresponding vas deferens. Its inner surface is in contact throughout with that of the opposite side, whilst its base comes into relation with the peritoneal fold connecting the vasa deferentia. Each is invested by a thick layer of muscular fibre, which is continuous with that surrounding the membranous part of the urethra, the fibres diverging from their urethral extremities, so as to enclose each vesicula in a complete capsule. On slitting open the vesicula it is seen to be lined by a thick membrane, which is thrown into decussating folds throughout the greater part of its interior, so as to give rise to an appearance resembling the interior of the ventricles of the human heart. Towards the urethral extremity of the sac, however, these folds become parallel and uniformly longitudinal in direction. A transverse fold of large size separates the base of each from the body of the sac, and so gives rise to an appearance of two compartments, as described by Cuvier. Each vesicula terminates in a duct, which unites with the lower end of the corresponding vas to form the common ejaculatory duct, and finally opens on the side of the veru-montanum, and outside of the vesicula prostatica.

Prostate Glands. These little glands seem to have been observed by Duvernoi[1], although he was not aware of their nature, for he appears to have been of opinion that the prostate in the elephant is represented by what is now known to be Cowper's glands. Camper states that this gland in the elephant is the same as in other animals, but his figure is quite incorrect. Cuvier, however, describes them with tolerable accuracy.

They are four in number, two on each side, and of small size. They are placed below, and somewhat to the outer side

[1] *Comm. Acad. scient. Petropol.* tom. II.

of the urethral extremities of the seminal vesicles, those of each side being closely applied to one another. In form they are oval, and the external one is the larger. It measures two inches in length, and one in greatest breadth, whilst the smaller or internal one is 1½ inch in length, and half an inch in greatest breadth. They are invested with a layer of muscular fibre continuous with that which surrounds the seminal vesicles. On slitting them open each is seen to contain a central cavity of an oval form, lined with a membrane, which is thrown into well marked longitudinal folds, which converge toward the urethral extremity of the gland. From this extremity the duct of each, which is single, passes off to open into a depression on the floor of the urethra, on either side of the veru-montanum, the openings of the ducts of each side being close together. In consequence of the glands themselves being situated at some distance behind the point where the ducts open into the urethra, each of these runs in the wall of the urethra for a distance of an inch and a half.

Cowper's Glands. Cuvier is the only author who describes these with any degree of accuracy. Camper states that they are present, but gives neither description nor figure, whilst Duvernoi mentions a *single* gland of the size of a large apple, which, so far as one can make out from his description, evidently corresponds to one of Cowper's glands, although he himself is inclined to regard it as the prostate.

The glands, as usual, are two in number. They lie one on either side of the middle line of the perineum, and under cover of one of the perineal muscles, to be subsequently described. Each is oval in form, somewhat flattened, and measures 2½ inches in length, and 2 in greatest breadth. They are therefore of large size as compared with the prostates. As regards their structure each is composed of a number of cells or lacunæ communicating freely with one another; but no separation of the gland into two distinct portions with corresponding cavities, as described by Cuvier, could be made out. At the same time it is possible that the length of time the parts had been subjected to the action of spirit may have tended to obliterate these cavities. From the anterior extremity of the gland a single duct measuring 3 inches in length, and sufficiently large to admit of

the passage of a crow-quill, passes off, and, running for the anterior two-thirds of its extent through the spongy substance of the urethral bulbs, opens finally into the floor of the bulbous portion of the urethra by a valvular orifice. The orifices of opposite sides are separated by a distance of half an inch.

Cuvier states that each duct is formed by the junction of two smaller ones coming from the two portions of the gland above mentioned, but this arrangement cannot be traced in the present dissection. In addition to the perineal muscle concealing this gland and corresponding to the transverse muscle of Duvernoi, this author mentions another as being divisible into three distinct portions, and forming a capsule to the gland. This I failed to perceive.

Urethra. The membranous portion of this tube measures 8 inches in length from the neck of the bladder to the bulb of the urethra. It is invested by a continuous layer one quarter of an inch in thickness of transversely arranged muscular fibres. Passing backward toward the neck of the bladder, these fibres are seen to become oblique in direction, and continuous with those which invest the prostate glands and the seminal vesicles. In addition to this layer of muscular fibres this portion of the urethra is surrounded by an investment of cellular erectile tissue, continuous in front with the spongy tissue of the bulb of the urethra, and measuring an inch in thickness in transverse section in front, but thinning off gradually toward the neck of the bladder.

On opening this part of the urethra a median elevation is observed on the floor, projecting from the point where the fold of mucous membrane described in connection with the neck of the bladder subsides, and to slope obliquely forward and upward, terminating in the margin of the vesicula prostatica. This margin is circular in form, and the vesicula itself forms *a cul-de-sac* extending to the depth of a quarter of an inch in the substance of the veru-montanum. It will be observed, therefore, that it does not extend into the peritoneal fold connecting the posterior extremities of the vasa deferentia, as in many animals, but forms a mere shallow *cul-de-sac,* as in the cetacea. On each side of the veru is the slit-like orifice of the common ejaculatory duct. A well-marked fold of mucous membrane

extends from either side of the veru-montanum obliquely forward and outward, and in the angle between this fold and the veru are to be observed the openings of the prostatic ducts—two in number on each side. On the floor of the urethra, in front of the veru, are two small orifices, resembling the openings of small glands, but no such structures could be discovered in connection with them. The spongy portion of the urethra presents nothing worthy of note.

The *muscles of the penis* are four in number on each side, three of these being situated on the lower aspect of the organ, and one, the levator, on the upper: 1st, The *Levatores penis* have been described by Duvernoi and Cuvier, and figured by Camper. They do not arise, as stated by the two latter authors, from the pubis, but from the upper and lateral aspect of each corpus cavernosum, close to its attachment to the ischium, as well as, and principally from, the tuberosity of that bone. Each is a powerful muscle measuring 4 inches in breadth at its origin, where it rests upon the dorsal vessels and nerves of the penis, but narrows rapidly to its extremity, where it ends on a thick rounded tendon. This tendon unites with the corresponding structure of the opposite side at the junction of the posterior and middle thirds of the penis, the two together forming a single median tendon common to the two muscles, which is inserted, according to Camper, into the glans penis. As regards this point, however, I could not satisfy myself, as that portion of the organ was reserved as a Museum preparation. The common tendon as it passes along the dorsum is confined within a strong aponeurotic sheath, which is continuous with, and formed by, the tunica albuginea of the corpora cavernosa. As it lies in the sheath it is connected to the walls by a very lax connective tissue, which evidently permits of a considerable amount of motion of the tendon within its canal.

Of the muscles met with on the lower surface of the penis, the ischio-cavernosus lies to the outer side, the bulbo-cavernosus to the inner, and the compressor of Cowper's gland between these two. In order to an accurate description of these muscles, it may be as well to refer briefly in the first place to the perineal fasciæ. On removing the skin and superficial fascia from the region of the perineum the deep or proper perineal

fascia is seen to be of great strength, and forms a general covering to all the muscles of this region. It is attached on each side to the external margin of the corresponding crus penis, and is prolonged forward so as to form a distinct covering to the corpora cavernosa. From the deeper aspect of this portion of the fascia on each side of the middle line two processes of great strength dip down to be attached to the floor of the perineum. Of these, one intervenes between the ischio-cavernosus and compressor of Cowper's gland on the outer, and the bulbo-cavernosus on the inner side; whilst the other separates the ischio-cavernosus and compressor from one another. From this it will be seen that each of the perineal muscles is enclosed within a distinct fibrous capsule formed by the perineal fascia, and from certain of the aponeurotic septa just mentioned different muscles take their rise.

The *ischio-cavernosus* muscle is described by Cuvier as consisting of four distinct portions, but these I failed to recognise. It is a muscle of no great size, and possesses two distinct origins. The posterior of these having been removed from its attachment could not be seen, but in all probability it corresponded to the usual origin of this muscle from the ischial tuber. The anterior portion of the muscle, which is however quite continuous with the posterior, takes origin from the outer side of the dilated extremity of the corresponding crus penis. The fibres all pass obliquely forward and inward to be inserted into the inner aspect of the crus, and thus furnishes a muscular investment to the dilated portion of the corpus cavernosum. This muscle is separated from the others in this region by the septal processes already described.

Compressor of Cowper's gland. This muscle, which is mentioned but not described by Cuvier, is also referred to by Duvernoi under the name of the transverse muscle of the perineum. It would seem, moreover, that this is the muscle figured by Camper in his drawing under the name of the short accelerator urinæ. The muscle has a fascial origin and insertion. It arises from the outer side of the aponeurotic septum, which intervenes between it and the bulbo-cavernosus, as also from the inner side of that which separates it from the ischio-cavernosus. The fibres form an elliptical belly which embraces

and conceals the perineal aspect of Cowper's gland. At the anterior extremity of this gland the fibres terminate on an aponeurotic septum, which is formed by the union of the two pieces of fascia which separate the muscle from its neighbours, and through the medium of this are inserted into the root of the corpus cavernosum. This muscle is to be regarded as connected physiologically with Cowper's gland, the secretion of which it is adapted to expel.

The *bulbo-cavernosus* muscle conceals the bulbous portion of the spongy body. It arises principally, along with the muscle of the opposite side, from a median tendinous raphè which rests upon the bulb. It has however an additio al origin by means of an elongated fleshy slip from the aponeurotic structures which form the floor of the perineum, which slip arises, along with that of the opposite side, as far back as the origins of the compressors of Cowper's glands, between which muscles it lies. From these origins the fibres pass obliquely forward and outward, so as to embrace the bulb, and are inserted into that portion of the fibrous envelope of the penis which intervenes between the corpus cavernosum and spongiosum.

Transverse muscle of the perineum. Muscles distinct from those already described bearing this name, are figured by Camper, but such are not present in my dissection, nor are they mentioned by any other author.

Penis. This organ, which in Duvernoi's specimen measured 6 feet in length and weighed 80 pounds, in the present case measures $2\frac{1}{2}$ feet from the attachment of the crus to the point. Each corpus cavernosum commences by a slightly dilated extremity where it is attached to the ischium, and coalesces at once with that of the opposite side, so as together to form two-thirds of the body of the penis, the remaining third being formed by the corpus spongiosum, each cavernous body diminishes gradually in transverse section from the root to the point of the penis, so that at a distance of 4 inches behind the glans each is diminished to one-third or one-fourth of its original diameter. The dilated extremity of each is covered by the ischio-cavernosus muscle. The corpora cavernosa are surrounded by a very strong fibrous envelope measuring one quarter of an inch in thickness at the root, but diminishing to one-half of this

toward the point of the organ. From the middle of the dorsal portion of this investment a strong fibrous pectiniform septum dips down to separate the two cavernous bodies. This septum is very incomplete, and permits of the continuity of the cavernous tissue across the middle line. This tissue is disposed in the usual manner, being denser toward the circumference than at the centre of each cavernous body. The large septa described by Camper as subdividing each corpus cavernosum are readily seen in different sections of the penis, but they are quite irregular, and are nothing but trabeculæ of larger size than those forming the mass of the cavernous tissue.

The corpus spongiosum commences by an elongated bulbous extremity at the root, and tapers gradually to the point of the penis, so that in form, as remarked by Duvernoi, it may not inaptly be compared to a large carrot. At the anterior extremity of the dorsal aspect of the penis is an elongated body closely resembling the backward prolongation of the glans in the horse. It measures 3 inches in length, and $2\frac{1}{2}$ in breadth, and is, I think, to be regarded as the glans. At the same time, it is to be observed that this body does not reach the point of the penis as in the horse, but is separated from it by a distance of 2 inches. Four inches behind the glans the spongy body does not measure in transverse section more than one-sixth of that of the bulbous portion. As regards its structure, the corpus spongiosum is similar to that of the corpus cavernosum, except in this respect, that the investing tunic of the former is much thinner than that of the latter, and, in fact, is little more than membranous. Through the upper part of the spongy tissue passes the canal of the urethra, and an imperfect median septum rising up from the lower part of the fibrous tunic is attached to the floor of that canal. This septum is distinct enough posteriorly, but disappears entirely toward the point of the penis. The bulbous portion is invested by the bulbo-cavernosi muscles, and into this portion of the urethra open the ducts of Cowper.

Vessels and nerves of the penis. Duvernoi describes an elaborate series of nervous and venous plexuses in connection with the penis, but these I failed to identify. The dorsal arteries lie one on either side of the middle line under

cover of the corresponding levator penis. Each runs forward as far as the extremity of the organ, accompanied by the vein and nerve, the former lying to its inner, the latter to its outer side. In this course it gives off many branches for the supply of the organ, one of which, larger than the others, given off about the middle in length of the penis, runs obliquely downward and forward, to supply the lateral and inferior aspects of the organ.

The dorsal veins accompany the arteries lying to their inner side. Close to the root of the penis the veins of opposite sides communicate by a number of branches, so as to form a plexus on the dorsum of the organ, and this plexus communicates freely with the interior of the cavernous bodies. It will be observed, therefore, that there is not a single vein as stated by Owen, but that these correspond in number with that of the arteries.

The dorsal nerves accompany the vessels, and run as far as the extremity of the penis. In this course they give off many branches for the supply of the skin and other parts of the organ. Of the third, or median dorsal nerve described by Duvernoi as forming a remarkable plexus in this region, nothing could be seen. Neither was there any fat present.

Prepuce.—The skin is reflected from the penis just behind the glans, to form a well-marked prepuce.

The orifice of the urethra is, as stated by Camper, Y-shaped, the two limbs being directed upward, the stem downward.

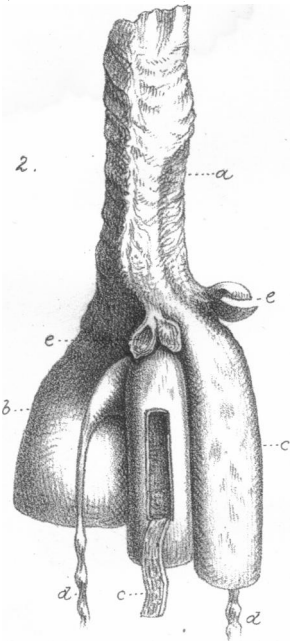
DESCRIPTION OF PLATE IV.

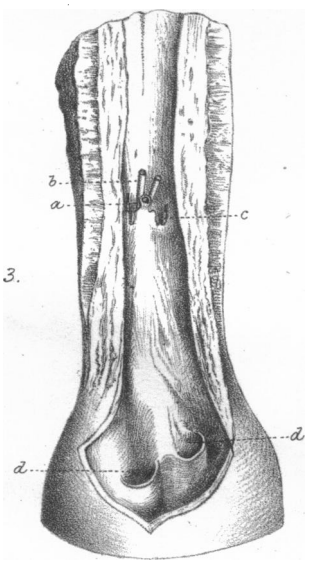
Fig. 1. The injected ureter and calyces of the right kidney.

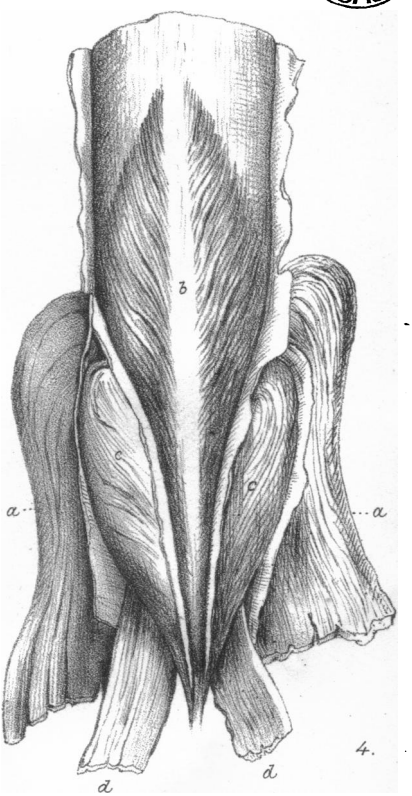
Fig. 2. The inferior surface of *a* the membranous part of the urethra. *b.* neck of the bladder. *cc.* vesiculæ seminales. *dd.* vasa deferentia. *ee.* prostate glands. The right vesicula and prostate have been opened.

Fig. 3. The canal of the membranous part of the urethra has been opened to display *a.* the vesicula prostatica; *b.* the bristles introduced into the ejaculatory ducts; *c.* those introduced into the prostatic ducts; *dd.* the openings of the ureters.

Fig. 4. Perineal muscles and fascia. *aa.* ischio-cavernosi. *bb.* bulbo-cavernosi. *cc.* compressors of Cowper's glands. *dd.* internal fibres of sphincter ani.







H L Saxby, M.D. del[t]

M[c] Farlane & Erskine, Lith[rs] Edin[r]

GENITO URINARY ORGANS OF ELEPHANT.